December 1988
W/Not. #4
(November 1992)
Superseding
CEGS-07112
(October 1985)
typed 24 Feb 93

SECTION 07112 - BITUMINOUS WATERPROOFING

PART 1 - GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 208	(1972; R 1982) Insulating Board (Cellulosic Fiber), Structural and Decorative.
ASTM C 726	(1988) Mineral Fiber Roof Insulation Board.
ASTM D 41	(1985) Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing.
ASTM D 173	(1986) Bitumen-Saturated Cotton Fabrics Used in Roofing and Waterproofing.
ASTM D 449	(1989) Asphalt Used in Dampproofing and Waterproofing.
ASTM D 1327	(1986) Bitumen-Saturated Woven Burlap Fabrics Used in Roofing and Waterproofing.
ASTM D 1668	(1986) Glass Fabrics (Woven and Treated) for Roofing and Waterproofing.

ASTM D 2822 (1991) Asphalt Roof Cement.

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01300 SUBMITTAL DESCRIPTIONS:

SD-06, Instructions\

Application\; *FIO*\.

Manufacturer's installation instructions, before delivery of materials to the site. Instructions shall specify acceptable range of bitumen application temperatures and the maximum temperature for holding bitumen in a heated condition.

SD-13, Certificates\

Materials\; *FIO*\.

Certificates attesting that the materials meet the requirements specified.

1.3 PRODUCT DELIVERY, STORAGE, AND HANDLING

Materials shall be delivered to the site in sealed containers bearing the manufacturer's original labels. Materials shall be stored in an enclosed area free from contact with soil and weather and maintained at not less than 50 degrees F for at least 24 hours before use.

PART 2 - PRODUCTS

2.1 MATERIALS

Materials shall conform to the following requirements:

2.1.1 Asphalt

ASTM D 449, Type II.

2.1.2 Fabric

ASTM D 173, ASTM D 1327, or ASTM D 1668.

2.1.3 Bituminous Cement

Asphalt base, ASTM D 2822, Type I

2.1.4 Primer

ASTM D 41 for asphalt

2.1.5 Insulation Board

ASTM C 208, construction grade, 1/2-inch thick, asphalt saturated or coated; ASTM C 726, 7/16-inch thick; or prefabricated membrane board 1/8-or 1/4-inch thick, consisting of asphalt-saturated felt laminated under pressure to both sides or with felt laminated on the bottom and a fiberglass mat laminated on top with a mineral-filled asphalt core.

2.1.6 Nails and Fasteners

As recommended by the felt manufacturer.

PART 3 - EXECUTION

3.1 PREPARATION

Preparation of surfaces to be waterproofed shall be as shown on drawings or as specified in SECTION [03300 CONCRETE FOR BUILDING CONSTRUCTION] and Section [04200 MASONRY]. Items that penetrate the membrane shall be installed before waterproofing is applied. Surfaces shall be smooth and swept thoroughly to remove foreign materials immediately before waterproofing is applied. Waterproofing shall not be applied if frothing or bubbling occurs when hot bitumen is applied to the surface. The hot bitumen must stick tightly to the surface. When waterproofing is applied in an enclosed space, adequate ventilation shall be provided.

3.2 APPLICATION

Waterproofing shall be 2 plies of asphalt saturated fabric applied in solid moppings of hot asphalt. Waterproofing shall be applied when the ambient temperature is 40 degrees F or above. Asphalt shall not be heated higher than 75 degrees above the EVT or 50 degrees below the flashpoint, or 525 degrees F (maximum) whichever is lower. EVT and flashpoint temperatures of asphalt in the kettle shall be conspicuously posted on the kettle. Heating kettles and tanks shall be provided with automatic thermostatic control capable of

maintaining bitumen temperature. Temperature of bitumen at time of application shall be in accordance with the bitumen manufacturer's recommendation. Temperature shall be measured with a portable thermometer at the point of application immediately before its use. Bitumen with a temperature not conforming to the manufacturer's recommendations shall be returned to the kettle. Bitumen overheated by more than 50 degrees F for more than 1 hour shall be removed from the site.

3.2.1 Priming

Surfaces shall be coated uniformly with primer at the rate of not less than 1 gallon per square.

3.2.2 Membrane

Membrane shall be applied in bitumen applied uniformly at the rate for each ply of not less than 25 pounds of asphalt per square. Fabric shall be broomed in full width into the hot bitumen to eliminate air pockets, wrinkles or similar deficiencies. Brooms shall have soft bristles and shall be discarded when bitumen buildup on the fibers prevents application of equal pressure across the broom width. Plies shall be applied shingle fashion and the fabric shall be coated thoroughly. Membrane applied to vertical surfaces shall be nailed through the top layer with roofing nails and 1-inch diameter steel disks at 10 inches on center.

3.2.3 Final Coat

Horizontal surfaces shall be final coated, using not less than 60 pounds of asphalt per square. Vertical surfaces shall be given a final mopping of not less than 25 pounds of asphalt over the asphalt-saturated fabric membrane per square. Bitumen shall be applied solidly over area to be covered by the fabric and shall extend beyond the edges of fabric on all sides.

3.2.4 Fabric Reinforcing

Reinforcing consisting of two plies of fabric and moppings of bitumen shall be provided over the membrane at corners, angles, over construction joints, and points where the membrane may be subject to unusual stress. Where slabs abut walls, the first ply of reinforcing shall extend at least 6 inches on the slab and 8 inches on the wall. At vertical corners, the first ply shall extend at least 5 inches from

the corner on each side. The second ply shall lap the first ply by at least 2 inches.

3.3 PROTECTION

Waterproofing against which backfill is to be placed shall be protected by a single thickness of insulation board. The insulation board shall be pressed into the final mopping while the bitumen is still hot, with edges of boards brought into moderate contact and joints staggered. Where surfaced insulation board is used, the surfaced side shall face outward. Boards shall be carefully and neatly fitted around projections and shall cover the entire surface of the waterproofing. Waterproofing not covered with insulating fiberboards shall be protected as necessary to prevent damage from subsequent building operations.

- - o 0 o - -

CEGS-07220
(May 1993)
Superseding
CEGS-07220
(November 1988)
typed 28 Oct 94

SECTION 07220 - ROOF INSULATION

PART 1 - GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ASTM C 728	(1991) Perlite Thermal Insulation Board.
ASTM D 41	(1985) Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing.
ASTM D226	(1989) Asphalt Saturated Organic Felt Used in Roofing and Waterproofing
ASTM D 312	(1989) Asphalt Used in Roofing.
ASTM D 4586	(1986) Asphalt Roof Cement, Asbestos Free.

FACTORY MUTUAL ENGINEERING AND RESEARCH (FM)

FM P7825	(1992; Supple I, II & III) Approval Guide.

UNDERWRITERS LABORATORIES (UL)

UL-01	(1992) Building Materials Directory.

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01300 SUBMITTAL DESCRIPTIONS:

SD-06, Instructions\

Application of Insulation\; *FIO*\.

Insulation manufacturer's recommendations for the application and installation of insulation.

SD-08, Statements\

Inspection\; *FIO*\.

The inspection procedure for insulation installation, prior to start of roof insulation work.

SD-13, Certificates\

Insulation\; *FIO*\.

Organic Roofing Felt\; *FIO*\

Certificate attesting that the expanded perlite insulation contains recovered material and showing estimated percent of recovered material.

Certificates of compliance for felt materials.

1.3 STORAGE OF MATERIALS

Insulation and felt shall be kept dry at all times, before, during, and after delivery to the site and shall be stored in an enclosed building or in a closed trailer. Wet insulation or wet felt shall be permanently removed from the site.

1.4 FIRE CLASSIFICATION

Insulation shall have been tested as part of a roof construction assembly of the type used in this project and the construction shall be listed as Fire-Classified in UL-01 or Class I in FM P7825.

PART 2 - PRODUCTS

2.1 BITUMINOUS MATERIALS

Bituminous materials shall conform to the following requirements:

2.1.1 Asphalt Bitumen

ASTM D 312, Type III or IV. Asphalt flash point, finished blowing temperature, and equiviscous temperature (EVT) shall be indicated on bills of lading or on individual containers.

2.1.2 Asphalt Cement

ASTM D 4586, Type I for horizontal surfaces; Type II for vertical surfaces.

2.1.3 Asphalt Primer

ASTM D 41.

2.2 INSULATION

Insulation shall be a standard product of the manufacturer and shall be factory marked with the manufacturer's name or trade mark, the material specification number, the R-value at 75 degrees F, and the thickness. Minimum thickness shall be as recommended by the manufacturer. Boards shall be marked individually. The thermal resistance of insulation shall be not less than the R-value shown on the drawings. The minimum thickness of tapered insulation shall be in accordance with the insulation manufacturer's recommendations for the substrate on which the tapered insulation is to be installed and shall not allow condensation within the insulation. Insulation shall contain the highest practicable percentage of material which has been recovered or diverted from solid waste, but not including material reused in a manufacturing process. Where 2 materials have the same price and performance, the one having the higher recovered material content shall be selected. Insulation shall be the following material:

2.2.1 Expanded-Perlite Insulation Board

ASTM C 728 with a minimum recovered material content of 23 percent of the expanded perlite portion of the board.

2.3 FASTENERS

2.3.1 Fasteners

Insulation manufacturer's recommendations except holding power, when driven, shall be not less than 40 pounds each in steel deck. Fasteners for steel decks shall conform to FM P7825 for Class I roof deck construction, and shall be spaced to withstand an uplift pressure of 60 pounds per square foot.

2.3.2 Metal Disks

Flat and not less than 30 gauge thickness. Disks used with fasteners for securing board insulation shall be minimum 2-1/8 inches in diameter.

2.4 ORGANIC ROOFING FELT

ASTM D226, Type I

2.5 WOOD NAILERS

Wood nailers shall conform to Section 06100 ROUGH CARPENTRY including preservative treatment. Edge nailers shall be not less than nominal 6 inches wide and of thickness to finish flush with the top surface of the insulation.

PART 3 - EXECUTION

3.1 COORDINATION REQUIREMENTS

Insulation and roofing membrane shall be finished in 1 operation up to the line of termination at the end of each day's work. Completed sections shall be waterproofed when more than 1 day is required to finish the roofing. Phased construction will not be permitted.

3.2 ENVIRONMENTAL CONDITIONS

Air temperature shall be above 40 degrees F and there shall be no visible ice, frost, or moisture on the roof deck when the insulation and roofing are installed.

3.3 SUBSTRATE PREPARATION

The substrate construction of any bay or section of the building shall be completed before insulation work is begun thereon. Vents and other items penetrating the roof shall be secured in position and properly prepared for flashing. Prior to application of insulation, substrate joints shall be covered with a 4-inch strip of roofing felt, embedded in and coated with asphalt cement. Substrate surface shall be smooth, clean, and dry at time of application.

3.4 HEATING OF ASPHALT

Asphalt shall not be heated higher than 75 degrees F above the EVT or 50 degrees F below the flash point, or 525 degrees F, whichever is lower. EVT and flash point temperatures of asphalt in the kettle shall be conspicuously posted on the kettle. Kettle shall be provided with automatic thermostatic controls and an accurate thermometer. Kettle operators shall be in attendance at all times during heating to ensure that the maximum temperature is not exceeded. Asphalt shall be applied within a range of 25 degrees F below or above the EVT, or as specified by the manufacturer. Application temperature shall be measured at the mop bucket or mechanical applicator. Asphalt at a temperature below this range shall

be returned to the kettle. Flame-heated equipment shall not be placed on the roof.

3.5 INSTALLATION OF WOOD NAILERS

Nailers shall be secured to steel decks as indicated. Bolt anchors shall have nuts and washers countersunk, and bolts shall be cut flush with top of nailer. Powder-actuated fasteners, sized and spaced for nailer anchorage equivalent to that specified and indicated, may be used when approved.

3.6 APPLICATION OF INSULATION

Insulation shall be laid in 2 or more layers. Units of insulation shall be laid in courses parallel with the roof slope. End joints shall be staggered. Insulation shall be cut to fit neatly against adjoining surfaces. Joints between insulation boards shall not exceed 1/4 inch. Joints in successive layers shall be staggered with respect to joints of preceding layer. Where insulation is applied over steel deck, long edge joints shall continuously bear on surfaces of the steel deck. Insulation which can be readily lifted after installation is not considered to be adequately secured. Insulation shall be applied so that all roof insulation applied each day is waterproofed the same day. Phased construction will not be permitted.

3.6.1 Mechanical Fastening

On steel decks, or any slope exceeding 1/2 inch per foot, the first layer of insulation shall be mechanically fastened. Method of attachment shall be in accordance with recommendations of the insulation manufacturer and requirements specified.

3.6.2 Steel Decks

Uninsulated steel decks shall have insulation applied to span the steel deck flutes and to act as an underlayment for the roof membrane. First layer of insulation on steel deck shall be perlite board.

3.6.3 Installation

Except for the first layer on steel deck, insulation layers shall be laid in solid moppings of hot asphalt applied at a rate of at least 20 pounds per square. Asphalt shall not be applied further than one panel length ahead of roof insulation being installed. Where roof slopes are greater

than 1/2 inch per foot, roof insulation shall be held in place by both asphalt mopping and mechanical fasteners.

3.6.4 Protection Requirements

The insulation shall be kept dry at all times. Insulation boards shall not be kicked into position. Exposed edges of the insulation shall be protected by cutoffs at the end of each work day or whenever precipitation is imminent. Cutoffs shall be 2 layers of bituminous-saturated felt set in plastic bituminous cement. Cutoffs shall be removed when work is resumed. Edges of insulation at open spaces between insulation and parapets or other walls and spaces at curbs and scuttles shall be protected until permanent roofing and flashing is applied. Storing, walking, wheeling, or trucking directly on insulation or on roofed surfaces will not be permitted. Smooth, clean board or plank walkways, runways, and platforms shall be used, as necessary to distribute weight to conform to indicated live load limits of roof construction.

3.7 INSPECTION

The Contractor shall establish and maintain an inspection procedure to assure compliance of the installed roof insulation with the contract requirements. Any work found not to be in compliance with the contract shall be promptly removed and replaced or corrected in an approved manner. Quality control shall include, but not be limited to, the following:

a. Observation of environmental conditions; number and skill level of insulation workers; start and end time of work.

b. Verification of certification, listing or label compliance with FM P7825.

c. Verification of proper storage and handling of insulation materials before, during, and after installation.

d. Inspection of mechanical fasteners; type, number, length, and spacing.

e. Coordination with other materials, including wood nailers.

f. Inspection of insulation joint orientation and laps between layers, joint width and bearing of edges of insulation on deck.

g. Installation of cutoffs and proper joining of work on subsequent days.

h. Continuation of complete roofing system installation to cover insulation installed same day.

- - o 0 o - -

SECTION 07270 - FIRESTOPPING

PART 1 - GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM E 84	(1991a) Surface Burning Characteristics of Building Materials
ASTM E 814	(1988) Fire Tests of Through-Penetration Fire Stops

UNDERWRITERS LABORATORIES (UL)

UL-05	(1992) Fire Resistance Directory
UL 723	(1983; Rev thru Apr 1987) Test for Surface Burning Characteristics of Building Materials
UL 1479	(1983; Rev thru Feb 1993) Fire Tests of Through-Penetration Firestops

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01300 SUBMITTAL DESCRIPTIONS:

SD-04 Drawings\

Firestopping Materials\; *FIO*\.

Detail drawings including manufacturer's descriptive data, typical details, installation instructions and the fire-test data and/or report as appropriate for the fire resistance rated construction and location. Submittal shall indicate the firestopping material to be provided for each type of application. When more than 5 penetrations are to receive firestopping, drawings shall indicate location and type of application.

SD-13 Certificates\

Firestopping Materials\; *FIO*\.

Certificates attesting that firestopping material complies with the specified requirements. The label or listing of the Underwriters Laboratories will be acceptable evidence. In lieu of the label or listing, a written certificate may be submitted from an approved, nationally recognized testing agency equipped to perform such services, stating that the items have been tested and conform to the specified requirements and testing methods.

Installer Qualifications\; *FIO*\.

Manufacturer's certification stating that each installer is qualified and trained to install the specified firestopping material.

Inspection\; *FIO*\.

Manufacturer's representative certification stating that firestopping work has been inspected and found to be applied according to the manufacturer's recommendations and the specified requirements.

1.3 GENERAL REQUIREMENTS

Firestopping shall consist of furnishing and installing a material or a combination of materials to form an effective barrier against the spread of flame, smoke and gases, and maintain the integrity of fire resistance rated walls, partitions, floors, and ceiling-floor assemblies, including through-penetrations and construction joints. Through-penetrations include the annular space around pipes, tubes, conduit, wires, cables and vents. Construction joints include those used to accommodate expansion, contraction, wind, or seismic movement; firestopping material shall not interfere with the required movement of the joint.

1.4 STORAGE AND DELIVERY

Materials shall be delivered in the original unopened packages or containers showing name of the manufacturer and the brand name. Materials shall be stored off the ground and shall be protected from damage and exposure to elements. Damaged or deteriorated materials shall be removed from the site.

1.5 INSPECTION

A representative of the manufacturer shall be on the site during the initial firestopping applications and periodically during the application period to ensure that preparations are adequate, that surfaces are clean and suitable for application, and that materials are applied according to the manufacturer's recommendations and the contract requirements.

PART 2 - PRODUCTS

2.1 FIRESTOPPING MATERIALS

Firestopping materials shall consist of commercially manufactured products complying with the following minimum requirements:

2.1.1 Fire Hazard Classification

Material shall have a flame spread of 25 or less, and a smoke developed rating of 50 or less, when tested in accordance with ASTM E 84 or UL 723. Material shall be an approved firestopping material as listed in UL-05.

2.1.2 Toxicity

Material shall be nontoxic to humans at all stages of application.

2.1.3 Fire Resistance Rating

Firestopping will not be required to have a greater fire resistance rating than that of the assembly in which it is being placed.

2.1.3.1 Through-Penetrations

Firestopping materials for through-penetrations, as described in paragraph GENERAL REQUIREMENTS, shall provide "F" and "T" fire resistance ratings in accordance with ASTM E 814 or UL 1479, except that T Ratings are not required for penetrations

smaller than or equal to a 4-inch nominal pipe or 16 square inches in overall cross sectional area. Fire resistance ratings shall be the following:

a. Penetrations of Fire Resistance Rated Walls and Partitions: F Rating = one hour, T Rating = one hour.

b. Penetrations of Fire Resistance Rated Floors and Ceiling-Floor Assemblies; F Rating = one hour, T Rating = one hour.

2.1.3.2 Construction Joints and Gaps

Fire resistance ratings of construction joints, as described in paragraph GENERAL REQUIREMENTS, and gaps such as those between floor slabs or roof decks and curtain walls shall be the same as the construction in which they occur.

PART 3 - EXECUTION

3.1 PREPARATION

Areas to receive firestopping shall be free of dirt, grease, oil, or loose materials which may affect the fitting or fire resistance of the firestopping system.

3.2 INSTALLATION

Firestopping material shall completely fill void spaces regardless of geometric configuration, subject to tolerance established by the manufacturer. Firestopping for filling floor voids 4 inches or more in any direction shall be capable of supporting the same load as the floor is designed to support or shall be protected by a permanent barrier to prevent loading or traffic in the firestopped area. Firestopping shall be installed in accordance with manufacturer's written instructions. Firestopping shall be provided in the following locations:

a. Penetrations of duct, conduit, tubing, cable and pipe through floors and through fire-resistance rated walls, partitions, and ceiling-floor assemblies.

b. Gaps at the intersection of floor slabs and exterior walls.

c. Gaps at perimeter of fire-resistance rated walls and partitions, such as between the top of the walls and the bottom of roof decks.

d. Construction joints in floors and fire rated walls and partitions.

e. Other locations where required to maintain fire resistance rating of the construction.

3.3 INSPECTION

Firestopped areas shall not be covered or enclosed until inspection is complete and approved. A manufacturer's representative shall inspect the applications initially and periodically during the work to ensure that the completed work has been accomplished according to the manufacturer's written instructions and the specified requirements.

- - o 0 o - -

FW-07321
Superseding
FW-07321
5 Nov 1990
typed 23 May 94

SECTION 07321 - ROOFING TILES

PART 1 - GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

FEDERAL SPECIFICATIONS (FS)

FS TT-S-001543	(Rev. A) Sealing Compounds Silicone Rubber Base (For Calking, Sealing, and Glazing in Buildings and Other Structures)

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 226	(1982) Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing
ASTM C 270	(1992) Mortar for Unit Masonry
ASTM D 312	(1989) Asphalt Used in Roofing
ASTM D 4586 Asbestos Free	(1986) Asphalt Roof Cement,
ASTM E 108	(1991a) Fire Tests of Roof Coverings

AMERICAN WOOD PRESERVERS' ASSOCIATION (AWPA)

AWPA M4	(1991) The Care of Preservative-Treated Wood Products

AMERICAN WOOD PRESERVERS BUREAU (AWPB)

AWPB LP 2	(1988) Softwood Lumber, Timber and Plywood Pressure Treated with Waterborne Preservatives for Above Ground Use
AWPB LP 22	(1988) Softwood Lumber, Timber and Plywood Pressure Treated with Waterborne Preservatives for Ground Contact Use

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01300 SUBMITTAL DESCRIPTIONS:

SD-01 Data\

Roofing Tile\; *FIO*\.

Manufacturer's Catalog Data.

SD-04 Drawings\

Roofing Tile\; *FIO*\.

Detail drawings shall include material lists, templates, and erection and installation details for all roof tile work. Submittals shall be complete, indicating material description, such as thickness, type, shape, and dimensions, and recommended installation procedures.

SD-13 Certificates\

Roofing Tile\; *FIO*\.

Furnish certificates certifying that the tiles conform to the specified requirements.

SD-14 Samples\

Roofing Tile\; *GA*\.

Roofing Tile Accessories\; *FIO*\.

Submit one sample of each type of tile and accessory. Samples shall be full size and shall be

taken from the same manufacturer's lot as the tiles that will be installed on the project.

1.3 DELIVERY, STORAGE AND HANDLING

Materials shall be delivered in manufacturer's unopened bundles and containers with the manufacturer's brand and name marked clearly thereon. Tile shall be stored in accordance with manufacturer's printed instructions and in a safe place away from traffic and construction activity. Roll goods shall be stored on end in an upright position. Immediately before laying, roofing felt shall be stored for 24 hours in an area maintained at a temperature not lower than 50 degrees F.

1.4 JOB CONDITIONS

Felt underlayment and tile shall not be installed on wet, frozen, or icy surfaces.

PART 2 - PRODUCTS

2.1 ROOF TILE

2.1.1 Tile and Trim

Tile and trim shall be Spanish "S" straight-barrel, smooth finish style. Style and color to match the existing tile roofs of the Headquarters AFNEWS Building on East Kelly AFB. Tile size shall be nominal 13 inches wide by 17 inches long for concrete tile. Weight shall be approximately 9 pounds per square foot per tile. Tile shall conform to ASTM E 108, Class A Standards.

2.1.2 Material

All tile, trim, and accessories shall be concrete products manufactured from one manufacturer and one material source.

2.1.3 Trim

Trim pieces shall include all special shapes such as eave closures; hip, rake, and ridge pieces; and all other trim required for a complete and watertight installation.

2.2 FELT UNDERLAYMENT

Felt underlayment shall be ASTM D 226, Type II (No. 30).

2.3 NAILS AND FASTENERS

2.3.1 For Securing Felt Underlayment

Nails and fasteners for securing the felt underlayment shall be corrosion-resistant large-headed of the type recommended by the felt manufacturer.

2.3.2 For Securing Tile

Nails and fasteners for securing tiles shall be corrosion-resistant nails, 11 gauge minimum, with a head size of not less than 5/16 inch diameter, and of a length sufficient enough for 3/4-inch penetration into the deck without penetrating to the underside of the deck.

2.3.3 High Wind Anchors

High wind anchors shall be corrosion-resistant, type as recommended by the tile manufacturer.

2.4 ASPHALT PLASTIC CEMENT

Asphalt plastic cement shall be ASTM D 4586.

2.5 SEALANT

Silicone sealant conforming to FS TT-S-1543.

2.6 MORTAR

Mortar shall conform to ASTM C 270, Type S, color to match tile.

2.7 WOOD STRIPS, STRINGERS, AND BATTENS

Standard or No. 2 grade lumber or construction grade redwood. All lumber other than redwood shall be preservative pressure-treated in accordance with AWPB LP 2 or AWPB LP 22. Exposed areas of treated wood that are cut or drilled after treatment shall receive a field treatment in accordance with AWPA M 4.

2.8 Bitumen

Bitumen shall be asphalt, ASTM D 312, Type IV.

PART 3 - EXECUTION

3.1 PREPARATION OF SURFACES

The construction of any bay or section of roof decking shall be completed before roofing work is started. Tile shall not be stored on the roof unless ready for immediate installation. Tiles shall not be installed until all other trades requiring traffic on the roof have completed their work.

3.1.1 Roof Deck Condition

Roof surfaces shall be smooth, firm, dry, and free from loose boards, large cracks, and projecting ends that might damage the roofing.

3.1.2 Roof Penetrations

Vents and other projections through the roofs shall be properly flashed and secured in position; projecting nails shall be driven firmly home.

3.1.3 Roof Deck Defects

Work shall not proceed until all defects have been satisfactorily corrected and the roof deck is broom clean.

3.2 APPLICATION

3.2.1 Flashings

Metal flashings, conforming to Section 07600 SHEET METALWORK, GENERAL, shall be provided at the intersections of roofs and adjoining walls and at projections through the deck such as vent stacks.

3.2.1.1 At Sides of Walls

At sides of walls, extend the flashing at least 6 inches up vertical surfaces. Thoroughly counterflash. Extend flashing under the tile at least 4 inches and turn the edge up 1-1/2 inches.

3.2.1.2 At the Lower Side of Walls

At the lower side of walls, extend flashing at least 3 inches up vertical surfaces, 4 inches over the tile, and thoroughly counterflash.

3.2.2 Underlayment

Before roof tiles are applied, apply two layers of felt underlayment shingle-fashion to the roof deck sheathing, including hips, and ridges. Felt plies shall be laid at right angles to the slope of the deck, lapping 2 1/2 inches horizontally and vertically. Fasten all edges with large headed corrosion resistant nails spaced 6 inches on center. Extend the felt 6 inches up all vertical surfaces and 6 inches over gutter metal.

Areas located between roof eave edge and a point 24 inches beyond the interior face of the exterior wall shall have the two plies of felt underlayment cemented to each other with solid moppings of bitumen in addition to nailing.

3.2.2.1 Heating of Bitumen

Asphalt shall not be heated higher than 75 degrees F above the EVT or 50 degrees below the flash point or 525 degrees F (maximum) whichever is lower. EVT and flash point temperatures of asphalt in the kettle shall be conspicuously posted on the kettle. Heating kettles shall be provided with automatic thermostatic controls and an accurate thermometer. Kettle operators shall be in attendance at all times during the heating to insure that the maximum temperature specified is not exceeded. Equipment utilizing flame-heat shall not be placed on the roof.

3.2.2.2 Bitumen Application

Asphalt shall be applied within a range of 25 degrees F below to 25 degrees F above the EVT. Application temperatures shall be measured at the mop bucket or mechanical applicator. Bitumen at a temperature below the recommended temperature shall

be returned to the kettle. Each layer of felt shall be laid in not less than 20 pounds or more than 35 pounds of asphalt per square.

3.2.3 Roof Tiles

Installation shall be as described below, supplemented as required by the tile manufacturer's recommendations. Prior to installing the tile:

a. Install strips, 1 inch by 2 inches in size, full length, along all eaves to raise the first course of tile, and along both sides of each ridge.

b. Install 1-inch wood stringers of the required height at ridges and rakes for reception of ridge and rake tile.

c. Apply continuous battens, 1 inch by 2 inches in size, to the deck, parallel to the eave and spaced as required, and nail to the deck with 8-penny nails spaced 24 inches on center. To allow drainage through the battens, provide 1/2-inch cuts every 4 feet or mount the battens on 1/4-inch thick washers.

d. Chalk horizontal and vertical guide lines on the felt to aid in aligning the tiles. Spacing of the chalk lines shall be determined by measuring the tiles for average length and width exposures.

3.2.3.1 Field and Trim Tile Fastening

Roof tile, with uniform headlap, sidelap, and equal course spacing, shall be laid straight and true to line, parallel to eaves. Tiles shall lap at least 3 inches. Fasten each tile with one or two nails as recommended by the tile manufacturer. Each hip or ridge tile shall be fastened with at least one nail. Each rake tile shall be secured with at least two nails. All nails shall penetrate supporting members 3/4-inch or through the thickness of the sheathing, whichever is less. High wind anchors shall be installed as required by the tile manufacturer. Short courses shall be kept to a minimum.

3.2.3.2 Tile Overlapping Sheet Metal Flashing

Fasten tiles overlapping sheet metal flashing with copper wire and plastic cement.

3.2.3.3 Rake Tile

Cement rake tiles to field tile and fasten with nails.

3.2.3.4 Voids at Rakes

Voids at rakes shall be filled with mortar.

3.2.3.5 Cracked or Broken Tile

Cracked or broken tile shall be replaced.

- - o 0 o - -

FW-07531

Superseding
FW-07531
(26 Apr 1991)

typed 8 Jul 94

SECTION 07531 - ELASTOMERIC (EPDM) SINGLE PLY ROOFING

PART 1 - GENERAL

1.1 SUMMARY

Furnish the administration, facilities, materials, labor, equipment, and quality control (QC) necessary to integrate the work into the total building system so that leakage into the roofing system or building does not occur. The roofing system is an assembly of components including the underlayment and insulation as applicable, roofing membrane, elastomeric and metal flashings, and all related parts necessary to complete the assembly. The roofing system manufacturer is the elastomeric membrane manufacturer, who may or may not manufacture and market the other components of the roofing system. The manufacturer or his licensed/approved installer shall complete the work and provide a material and labor warranty for a 15-year period from date of final acceptance of the building. The 15-year government warranty (Attachment No. 4) shall be signed by the EPDM system manufacturer and provided to the Contracting Officer prior to final acceptance. QC procedures, tolerances, testing, and requirements are specified in these contract documents. Minimum roof slope shall not be less than 1/4 inch per foot.

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 412	(1987) Rubber Properties in Tension
ASTM D 517	(1992) Asphalt Plank

ASTM D 624	(1991) Rubber Property - Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers
ASTM D 746	(1979; R 1987) Brittleness Temperature of Plastics and Elastomers by Impact
ASTM D 1149	(1991) Rubber Deterioration - Surface Ozone Cracking in a Chamber
ASTM D 4637	(1987) Vulcanized Rubber Sheet Used in Single-Ply Roof Membrane

AMERICAN WOOD PRESERVERS BUREAU (AWPB)

AWPB LP 22	(1988) Softwood Lumber, Timber and Plywood Pressure Treated with Waterborne Preservative for Ground Contact Use

FACTORY MUTUAL ENGINEERING AND RESEARCH CORP (FM)

FM-01	(1986) Approval Standard Class I Roof Covers Class Number 4470
FM 1-28	(1991) Loss Prevention Data Sheet: Insulated Steel Deck

NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY (NIST)

NIST PS 1	(1983) Construction and Industrial Plywood

NORTHEASTERN LUMBER MANUFACTURERS ASSOCIATION, INC. (NELMA)

NELMA-01	(1991) Standard Grading Rules for Northeastern Lumber

SHEET METAL & AIR CONDITIONING CONTRACTORS' NATIONAL ASSN (SMACNA)

SMACNA-02	(1987) Architectural Sheet Metal Manual

SOUTHERN PINE INSPECTION BUREAU (SPIB)

SPIB-01	(1991; Supple 1 thru 4) Grading Rules

UNDERWRITERS LABORATORIES, INC (UL)

UL-01	(1992) Building Materials Directory
UL 790	(1983) Tests for Fire Resistance of Roof Covering Materials

WESTERN WOOD PRODUCTS ASSN (WWPA)

WWPA-01	(1991; Supple No. 1) Western Lumber Grading Rules

1.3 SUBMITTALS

Attachments 1 through 8 are attached at the end of this specification. Additional attachment forms may be obtained from the Contracting Officer if required. Submit requests for all changes (including resolution for variances) in writing. Do not proceed with any changes without written authorization of the Contracting Officer.

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01300 SUBMITTAL DESCRIPTIONS:

1.3.1 Roofing Conference Submittals

SD-01 Data\

Roofing System\; *GA*\.

(1) Furnish four copies of the latest edition of the elastomeric membrane manufacturer's published general requirements, technical literature, repair instructions, and material safety data sheets for each system to be used in this contract.

(2) Furnish four copies of the latest editions of all other material manufacturers's product and installation literature.

EPDM System Manufacturer\; *GA*\.

The EPDM System Manufacturer's Certification (Attachment No. 1). [This certification is a qualification for award of this contract. It shall be submitted as part of the bid, or executed prior to contract award, and be accepted by the Contracting Officer].

Roofing Quality Control Controller\; *GA*\.

Designation of Roofing Quality Control Controller (Attachment No. 3). The Contractor shall furnish this Attachment as required herein, modified as necessary, to identify the person in charge of roofing quality control. This Attachment shall be approved by the Contracting Officer before the roofing work starts.

Field Training Instructors\; *GA*\.

Submit the qualifications of the elastomeric membrane manufacturer's representative(s) who will be providing the field training to Base maintenance personnel on roof maintenance procedures, as specified in PART 3 paragraph FIELD TRAINING.

Warranty Copy\; *GA*\.

The manufacturer shall provide, for review, an unsigned copy of the Air Force EPDM Roofing System 15-Year Labor and Material Warranty (Attachment No. 4) that will be furnished upon satisfactory completion of the roofing system.

SD-06 Instructions\

System Summary Sheet\; *GA*\.

The System Summary Sheet (Attachment No. 2) shall be signed by both the perspective contractor and the elastomeric membrane manufacturer and submitted to the Contracting Officer at the roofing conference. This document shall be tailored to present project requirements to the roof system manufacturer who can then ascertain the technical aspects of the project and the acceptability of the design to their 15-year warranty system.

SD-13 Certificates\

Insulation and Fastener Manufacturers/Suppliers\; *FIO*\.

Certifications from the insulation and fastener manufacturers/suppliers that the materials to be used conform

to specified standards, as applicable, to produce the elastomeric roofing manufacturer's 15-year warranted system.

Materials\; *FIO*\.

Certification of Compliance for all other materials showing that such materials conform to the specified requirements and to the applicable reference standards.

Materials Ordered\; *FIO*\.

Evidence that the approved materials have been ordered.

1.3.2 Daily Submittals

The following information shall be submitted each day as applicable:

SD-09 Reports\

Quality Control Record\; *FIO*\.

Quality Control Record (AF Form 1063) (Attachment No. 8). Basic quality control (QC) requirements are specified in PART 4 - QUALITY CONTROL PROCEDURES. As a minimum, the Quality Controller shall perform each of the actions listed on a daily basis. Failure to perform these actions constitutes failure to perform and entitles the Government to remedial action.

Field Test Results\; *FIO*\.

Contractor shall furnish at his expense on request of the Contracting Officer field test results on a minimum of one per each membrane lot. Tests shall be performed by an approved recognized testing laboratory. Test results shall show elastomer type, tensile strength, Die "C" tear, elongation, and specific gravity.

SD-13 Certificates\

Factory Certification\; *FIO*\.

Factory certified test certificates from each lot of elastomeric membrane installed shall be furnished along with two (2) pieces, 12 inches square on receipt at job site. For this purpose, a lot shall be considered one shift (6 or 8 hours) of production from internal mixer and/or calendaring operation. Internal mixer production charts will be retained for two (2) years for each lot produced and shall be made

available for inspection in the event of membrane failure. Internal laboratory test records for compound specific gravity, tensile strength, elongation, and rheology shall be retained for each internal mixer batch in each lot for a two (2) year period and shall be made available for inspection in the event of membrane failure.

SD-14 Samples\

Roofing Membrane\; *FIO*\.

Samples of the completed roofing membrane. Use Attachment No. 5 for sample identification.

1.3.3 End of Job Submittals

The following information shall be furnished following completion of the roofing installation and before final acceptance:

SD-01 Data\

As-Built Roof Summary\; *FIO*\.

The Contractor shall submit the As-Built Roof Summary (Attachment No. 6) upon completion of this project.

Warranty\; *GA*\.

The manufacturer shall provide an executed copy of the Air Force EPDM Roofing System 15-Year Labor and Material Warranty (Attachment No. 4) upon satisfactory completion of the roofing system. It shall be provided to the Contracting Officer prior to final acceptance of the project.

SD-04 Drawings\

Roof Plan\; *FIO*\.

A plan view drawing of each roof showing location and dates of installation of each lot of membrane, identified by manufacturer's lot number.

1.4 QUALITY ASSURANCE (QA)

The Contractor shall provide the quality assurance evidence needed to establish confidence that quality control is being performed adequately. The requirements of this section shall be coordinated with those of Section 01440 CONTRACTOR QUALITY

CONTROL. Except as modified or supplemented herein, the Contractor shall follow the published requirements for methods of installation and written recommendations of the elastomeric roofing membrane manufacturer and other materials manufacturers.

1.4.1 Quality Control Definition

Quality Control (QC) is defined as follows:

a. Quality Control is the regulatory process by which the Contractor measures actual quality performance, compares it with standards, and acts on the differences. The QC function is the entire collection of activities through which fitness for use is achieved.

b. Quality control is Contractor inspection which is a careful and critical investigation of all work to verify that it conforms to the contract, detects variances, corrects these variances in a timely manner to prevent reworking and delay. On discovery of a variance, the Contractor shall immediately institute corrective action and insure that all future work conforms to the requirements of the contract.

1.4.2 Quality Controller

The Contractor shall designate a person to be the Quality Controller and be in charge of roofing quality control. The Quality Controller shall be knowledgeable in roofing technology and good workmanship practices, shall have at least 5 years experience in the supervision and inspection of elastomeric membrane (EDPM) roofing, and shall not be a principal or officer of the roofing contractor's company.

1.4.3 Basic Quality Control Requirements

a. Basic quality control (QC) requirements are specified in PART 4 of this section. As a minimum, the Quality Controller shall perform each of the actions listed on a daily basis. Failure to perform these actions constitutes failure to perform and entitles the Government to remedial action, including possible termination of the Contract for default.

b. The specified QC requirements are minimums. The Contractor shall provide additional QC if, in the opinion of the Contracting Officer, the QC is not effective enough to provide conforming work. This additional QC will not constitute a change to the contract.

1.4.4 Government Audit

The Contractor's Quality Controller will be subject to audit by a Government inspector. The Contractor shall provide all information necessary for the audit. The Government is not obligated to inspect a Contractor's work nor protect a Contractor from the consequences of malperformance of his work force. Government inspection is a general examination of the Contractor's conduct and work, and is solely for the purposes of the Government.

1.5 PRECONSTRUCTION CONFERENCE

Before the start of roofing work, the Contracting Officer will schedule a preconstruction conference at the air base to review the contract. The Quality Controller and foreman or superintendent shall attend the conference. Technical representatives from both the elastomeric membrane and the insulation manufacturers shall also attend the preconstruction conference. These representatives shall be knowledgeable in the installation peculiarities and compatibilities of their products. The Contractor and technical representative shall present, orally and documented, the installation procedures to be used. This conference may include a visit to the work site.

PART 2 - PRODUCTS

2.1 ROOF SYSTEM

2.1.1 Fire Safety

The complete roof covering assembly shall have UL 790 Class A or B classification, be listed as fire-classified in UL-01 or as Class I roof deck construction in FM-01.

2.1.2 Windstorm Resistance

The complete roof covering assembly shall be capable of withstanding an uplift pressure of 90 pounds per square foot when tested in accordance with the uplift pressure test described in the FM 1-28.

2.2 ELASTOMERIC EPDM MEMBRANE

Elastomeric EPDM membrane, shall conform to the general requirements of ASTM D 4637, 0.060 inch in thickness, that meets or exceeds the following physical properties:

Physical Property	Test Method	Minimum Test Result
Color Black		
Specific Gravity 1.12	ASTM D 297	
Tensile Strength 1300 psi	ASTM D 412	
Elongation at Break 300%	ASTM D 412	
Tear Resistance (Die C) 175 lb/in.		ASTM D 624
Sheet Composition % Polymer that is EPDM 100 % Sheet that is Polymer 30	ASTM D 297	

2.3 CEMENTS AND PRIMERS

Cements and Primers used for splicing, patching, and flashing shall be compatible to the polymers furnished, furnished by the same manufacturer as the membrane elastomer, and meet the manufacturer's published specifications for same.

2.4 FLASHINGS

2.4.1 Metal Flashings

Metal flashings to be installed at roofing shall conform to applicable paragraphs of Section 07601 SHEET METALWORK, GENERAL.

2.4.2 Elastomeric Flashing

Elastomeric flashing can be furnished in vulcanized or uncured condition, depending on membrane manufacturer's recommendation. When cured, both types shall meet or exceed the following test values:

Property	Test Method	Test Value
Tensile Strength	ASTM D 412	1200 psi
Elongation @ break	ASTM D 412	400%
Brittleness Temperature	ASTM D 746	-40 °F
Tear Resistance Die C	ASTM D 624	140 lb/in.
Resistance to Ozone	ASTM D 1149	No Cracks

2.5 SEALANTS

2.5.1 Lap sealant

Lap sealant shall be a one part elastomeric caulking/adhesive sealant furnished by elastomeric membrane manufacturer according to his latest published catalog. Shelf life shall be marked clearly on containers: "Do not use after _____;" and use shall not be permitted of expired material. Store and apply according to manufacturer's installation instructions.

2.5.2 Sealant For Difficult To Flash Penetrations or Objects

Sealant for difficult to flash penetrations or objects shall be an elastomeric, pourable material furnished by membrane manufacturer according to the manufacturer's latest published catalog. Shelf life shall be marked clearly on containers: "Do not use after _____;" and use will not be permitted of expired material. Store and apply according to the manufacturer's installation instructions.

2.5.3 Water Cut-Off Sealant

Water cut-off elastomeric sealant shall be used for end of day stopping point to adhere and seal space at the edges of the membrane and substrate. It shall be furnished by the elastomeric membrane manufacturer and shall meet the manufacturer's latest published catalog requirements. Store and apply according to manufacturer's installation instructions.

2.5.4 Other Sealers, Tack Coats, and Tapes

Other sealers, tack coats, and tapes used shall be compatible to the elastomeric membrane and shall be as furnished and recommended by membrane manufacturer. Use shall be in accordance with the manufacturer's recommendations and within the shelf life period designated on the containers. Asphalt or coal tar derivative products shall not be used in this construction.

2.6 WOOD PRODUCTS

NOTE: Lumber and plywood contained in this Section shall also comply with reference Specification Section: 06100 ROUGH CARPENTRY

2.6.1 Lumber Species

Lumber species shall be any of the following: Douglas fir, northern white pine, ponderosa pine, southern pine, jack pine, and red pine.

2.6.2 Grades

Lumber shall conform to WWPA-01, NELMA-01, or SPIB-01 grading rules for the specified grades for the lumber provided.

2.6.2.1 Enclosed and Incorporated Into The Roof System

Lumber that will be enclosed and incorporated into the roof system, such as nailers, sleepers, blocking, and decking, shall conform to the following:

(1) Lumber that is less than 2 inches in thickness, all widths, shall be WWPA-01 or NELMA-01 board Class, No: 2 common grade, or SPIB-01 No. 1 boards.

(2) 2x2 through 4x4 lumber shall be SPIB-01, WWPA-01, or NELMA-01 structural light framing class, No. 2 grade.

(3) Lumber that is 2 to 4 inches thick and over 4 inches wide shall be SPIB-01, WWPA-01, or NELMA-01 structural joists and planks class, No. 2 grade.

2.6.3 Preservative Treatment

Lumber, timber, and plywood that will be enclosed and incorporated into the roof system shall be pressure treated with AWPB LP 22, except acid copper chromate (ACC) preservative shall not be used.

2.6.4 Moisture

The moisture content for lumber and plywood shall be 12 percent, plus or minus 2 percent at delivery, in storage, at installation, and shall be maintained within these tolerances until painted or enclosed and incorporated into the roof system. Wood found exceeding this moisture level shall be conspicuously marked and removed from the job site. Before preservative treatment, wood products shall have been kiln dried to 12 percent moisture content. After pressure treatment, wood shall be kiln dried to the 12 percent moisture content again, and protected during shipment and storage.

2.6.5 Marking

2.6.5.1 Lumber

Each piece of lumber shall bear a grade stamp or grade mark showing the association under whose rules it was graded, the grade, the species, and either "S-DRY", "KD", or "MC-15".

2.6.5.2 Preservative-Treated Lumber

Each piece of preservative-treated lumber shall bear the AWPB Quality Mark.

2.7 INSULATION

Insulation board over which elastomeric roofing membrane will be installed shall conform to Section 07220 ROOF INSULATION.

2.8 CONCRETE WALKWAYS

Install as detailed and shown on the drawings in accordance with the elastomeric roofing membrane manufacturer's technical requirements.

2.8.1 Precast Concrete Paver Block

Precast concrete pavers, 3000 psi, 12 by 24 by 2-1/2 inches without sharp edges and projections, shall be furnished [as shown on the drawings. Provide an additional elastomeric sheet under concrete pavers or protection as recommended by the elastomeric roofing membrane manufacturer.

PART 3 - EXECUTION

3.1 ROOF PROTECTION REQUIREMENTS

3.1.1 Structural

Do not load or permit any part of a structure to be loaded with a weight that will endanger its safety of cause damage.

3.1.2 Roof Traffic

When wheeled or other traffic over the partially or fully completed roofing is unavoidable, use adequate plank or plywood protection for the roofing.

3.1.3 Fire

Provide at least one (1) portable ammonium phosphate or other dry type fire extinguisher at the work site in case of electrical or solvent fires.

3.1.4 Daily Cleanup

Remove all debris daily from the roof. Use enclosed chute, crane and bucket, or construction hoist to minimize and contain dust, dirt, and noise.

3.2 PREPARATION OF SURFACES

The entire substrate construction of any bay or section of the building shall be completed before roofing is begun. Roof surfaces shall be inspected and approved by the Quality Controller prior to initiating roofing work. The roof deck and surfaces to receive flashing shall be smooth and firm, and shall be free from ice, frost, surface moisture, dirt, sharp projections, and foreign materials such as oil, grease, and construction debris. All joints over 1/4-inch wide shall be sealed. Vents and other items penetrating the roof shall be secured in position and properly prepared for flashing. Nailers, curbs, and other items attached to roof surface shall be in place before insulation work is begun.

3.2.0.1 Roof Drains

Contractor shall check roof drains for free flow before and after completion of work. Keep debris out of roof drains during construction and return to operable condition at completion of work.

3.3 INSULATION INSTALLATION

3.3.1 General Requirements

Insulation shall be installed in accordance with the insulation and membrane manufacturers's recommendations unless otherwise specified.

3.3.1.1 Adequate Attachment

Insulation board that can be readily lifted or displaced by hand are not adequately secured. Reinstall adequately all lifted and displaced items that are not damaged. Replace damaged items with new materials.

3.3.2 Over Steel Deck

3.3.2.1 First (bottom) layer

The first (bottom) layer of insulation shall be laid in the following manner:

a. Place insulation with long side of boards parallel with deck flutes so that side joints between boards do not occur over the deck ribs.

b. Stagger and joints by maximum dimensions. Bring boards into moderate, uniform edge contact.

c. Secure all insulation boards in the first layer with mechanical fasteners over the entire roof deck in accordance with FM, UL, or membrane manufacturer requirements, but no less than six fasteners per 3 ft by 4 ft board. Filler pieces must have at least two fasteners.

d. Use driving methods prescribed by the fastener manufacturer.

3.3.2.2 Second or Additional Layers

Follow the installation instructions of the membrane manufacturer for subsequent layers of insulation or recovery board.

3.4 MEMBRANE INSTALLATION

Apply the membrane in accordance with the elastomeric membrane manufacturer's published instructions unless otherwise specified.

3.4.1 Fully Adhered Application

Apply adhesive evenly and continuously to substrate and underside of sheets at the rates recommended by the elastomeric sheet manufacturer's printed application instructions. Allow adhesive to dry to the consistency prescribed by the

manufacturer before adhering sheets to the substrate. Roll each sheet into adhesive to avoid wrinkles; broom or roll to remove air pockets and "fishmouths" and to ensure full, continuous bonding of sheet to substrate. Clean both mating surfaces at the splice area, supply adhesive, lap the adjoining sheets a minimum of 4 inches, and seal seams by centering a 6-inch wide uncured flashing along all field splices.

3.4.2 Walkways

Walkways around mechanical roof top equipment and access ways shall be placed as shown on the drawings. Installation shall be in accordance with the manufacturer's detailed requirements.

3.5 FLASHING AND FLASHING ACCESSORIES

Flashing, including perimeter flashing, flashing around roof penetrations, and prefabricated pipe seals, shall be 0.60-inch minimum thick uncured neoprene or uncured elastomeric sheet, as recommended by the elastomeric sheet manufacturer's printed data.

3.5.1 Membrane Field Seams

All membrane field seams shall be strip-in with a minimum of 6 inch wide uncured EPDM flashing materials.

3.5.2 Sheet Metal Accessories

Fabricate and install metal accessories as shown on drawings. Installation shall conform to the standards of the components and materials manufacturers, and the applicable details of the SMACNA-02 and shall be compatible with elastomeric membrane manufacturer's published flashing details.

3.5.3 Dissimilar Metals

Isolate dissimilar metals that will be in contact each other by painting with a dielectric coating or by using an uncured nonconducting elastomeric sheet gasket.

3.5.4 Sheet Metal with Flanges

Sheet metal accessories having flanges shall be installed as follows:

a. Set metal flanges over composition flashings and on the roofing membrane in a full bed of sealing cement furnished by the elastomeric membrane manufacturer.

b. Nail flanges to wood nailers, when present under membrane or flashing, such as at roof fasciae or gravel stops. Nail in two parallel rows 1-1/2 inches apart with one row 1/2 inch from the flange outer edge and staggered 3 inches on center with nails in the other row.

3.5.5 Roof Drains

Follow the applicable published requirements of the EPDM manufacturer or NRCA published details and procedures.

3.6 WOOD INSTALLATION

Provide wood members as indicated, necessary, and required for a complete, workmanlike system.

3.6.1 Fasteners

Provide fasteners at not more than 18 inches on center, and also within 6 inches of each end, to secure nailers to the building construction adequately. Fasteners shall be installed in a manner to resist a pullout force of 200 pounds per lineal foot of nailer.

3.6.2 Nailers

Where nailers are stacked, secure the top nailer to the lower with spikes or nails of the proper length, spaced 18 inches on center, staggered, and within 6 inches of all nailer ends.

3.6.3 Preservative Treatment

Brush apply one coat of concentrated solution of the preservative used in treatment onto all cut surfaces of preservative treated lumber.

3.7 SEALANT INSTALLATION

Follow the sealant manufacturer's installation requirements, including cleaning substrates to remove all contaminants that will prevent bonding. Prime surfaces and install back up material as required.

3.8 ROOFING QUALITY CONTROL

The Quality Controller shall review each day each significant feature and segment of the work.

3.8.1 Material Labelling

All material shall be delivered to the site in protected trucks with packaging intact and readable labels. Use materials having labels that:

a. Identify the material and source.

b. Indicate conformance with the reference standard applicable to the material.

c. Indicate expiration of shelf life.

d. Indicate storage requirements (if any).

e. Identify lot and/or batch numbers of elastomeric materials.

3.8.2 Samples

Collect samples, 2 pieces, 12 inches by 12 inches each, of each lot of elastomeric roofing membrane. Plainly mark and dispatch as required for laboratory testing as directed by the Contracting Officer. Cost for sampling and testing shall be borne by the Contractor.

3.8.3 Storage and Handling

Store and handle all materials as follows:

a. Do not expose materials to moisture in any form before, during, or after delivery to site.

b. Store material in a completely enclosed building or trailer if possible. If necessary to store outdoors, stack materials on platforms or pallets at least 4 inches above ground and cover with waterproof canvas. Allow air circulation under canvas so condensation does not occur; do not extend to ground. Remove nonweathertight plastic manufacturer supplied packaging from insulation prior to storage; tear off labels and tuck in insulation stack for identification purposes.

c. Conspicuously mark unprotected or damaged materials and remove from the site.

d. Follow the manufacturer's instructions on sealers, caulking, tapes, cements, and potting compounds with regard to temperature of storage and provide heated or cooled storage as required.

3.8.4 Work Scheduling

Program work so that each area of the roofing system installation is completed the same day it is begun, including the installation of the roof membrane and all flashings within or attached to the membrane. Remove all installed material from areas where the system was begun to be installed but not completed on the same day, and do not reuse.

3.8.5 Temporary Water Cutoffs and Tie-Ins

Install temporary water cutoffs and tie-ins at the end of each workday. Do not cut the staggered insulation pieces that are already installed. Fill in the staggered sections to a straight edge line with unattached cut pieces of insulation, but do not include the temporary filler pieces in the permanent

roof system. Remove temporary cutoffs and tie-ins so that all vertical faces of insulation are exposed at the beginning of the next day's work.

3.8.6 Inclement Weather

Except for expedient temporary work, do not proceed with roofing work during inclement weather. Remove all temporary work and insure dry surfaces and components before installing permanent components and materials.

3.9 WARRANTY SIGN

Provide 10 inch by 12 inch minimum size painted signs, made of aluminum with a dark color background and letters of contrasting color. Use paint compatible with the aluminum. Sign shall read as indicated in Attachment 7. Permanently post signs at all access points leading to the roofs and at prominent points on the roofs. Provide at least one sign mounted on each roof with additional signs on each building located where directed by the Contracting Officer.

3.10 ROOF DRAIN TEST

After the roofing system is complete but prior to Government acceptance of the roofing, perform the following test of roof drains and adjacent roofing for water tightness. Plug roof drains and fill the drains with water for 24 hours. To ensure some drainage from the roof, do not test all drains at the same time. Measure water levels at the beginning and end of the 24-hour period. If precipitation occurs during the test period, repeat the test. If the water level falls, remove the water, thoroughly dry and inspect the installation, and repair or replace the roofing at the drain. Repeat the test until there is no water leakage.

3.11 FIELD TRAINING

Provide written and verbal instructions to designated Base Civil Engineering maintenance personnel. Instructions shall be provided by a competent representative of the roofing membrane manufacturer and shall include a minimum of 4 hours on inspection and maintenance of membranes.

3.12 ROOF REPAIRS

Repair of defects and/or damage to the membrane shall be repaired by the EPDM manufacturer's authorized and approved installer to preclude voiding the warranty.

PART 4 - QUALITY CONTROL PROCEDURES

4.1 GENERAL

The Quality Controller has the responsibility to assure that the Government obtains products and services as required by the contract. To accomplish this, the Controller shall continuously observe work in progress, including testing and measuring, and report findings on a daily record form (AF Form 1063, Quality Control Record).

4.2 QUALITY CONTROLLER

Before actual work begins, the Quality Controller shall:

a. Read the specifications and study the drawings.

b. Understand the required tests and measurements.

c. Understand AF Form 1063, Quality Control Record, and reporting procedures.

d. Visit the roof and become familiar with its layout.

e. Attend the preconstruction conference.

4.3 EQUIPMENT

Supply the following equipment for tests and measurements required to be performed under this contract:

a. Measuring tape, 50 or 100 ft, ft and inches, nonconducting.

b. Moisture meter for determining moisture content of wood (such as nailers or curbing) at time of installation.

4.4 ALLOWABLE TOLERANCES

The following tolerances establish the range of acceptable variances. Work outside this range shall be removed; act to prevent reoccurrence.

a. Dimensions (plus or minus)

(1) 1/16 inch for any single dimension less than 2 inches.

(2) 1/8 inch for any single lineal dimension 2 inches or more or aggregate of measurements to 10 feet, even.

(3) 1/4 inch for any aggregate of measurements exceeding 10 feet.

b. Insulation joint gap, minimum = O, maximum = 3/16 inch.

c. Lumber

(1) Straightness, no bows exceeding 0.1 percent, i.e., 1/8 inch in 10 ft, 1/16 inch in 5 ft.

(2) No twisted or split lumber allowed.

(3) Moisture content not to exceed 14% when installed.

4.5 QUALITY CONTROL RECORD

Complete AF Form 1063 (Attachment 8), daily, as follows (see completed sample):

a. Top section

(1) Insert date and record number.

(2) Insert weather description and temperature.

(3) Indicate crew start/stop times.

(4) Indicate your start/stop times.

(5) Indicate total roof area.

(6) Indicate roof area completed previous to date.

b. Products Section

This section is divided into major categories. Each category may include several materials:

(1) Examine each material within the category and check the proper box.

(2) Check the "Not Applicable" box for materials not included in today's work.

(3) Assure that all materials in a category comply with the contract to result in a check in the "Complies" box. To determine compliance, compare the material with the project specifications and drawings, and also with the approved manufacturer,s literature submitted. Since materials other than those covered by the components listed may be used, enter their compliance in the "All Other Materials" category.

c. Execution Section

(1) The work item numbers in this section of the record correspond to the work items in these basic QC requirements. The work items are specification items considered to be of major concern. These items are in the basic QC requirements for convenience and tabulation.

(2) Performance of the "Actions" below the work item will result in an entry in the proper box on the QC record.

Specification items not in the basic QC requirements must also be considered, and their acceptability grouped and documented in the "Other" box.

d. Variance Section

(1) An entry in any "Varies" box under the "Products" or "Execution" sections requires an explanation of the variance in this section. The explanation should be limited to a description of the variance only; reasons for variances are not necessary.

(2) Indicate action taken to resolve each variance to result in complying work. If a variance is not resolved on the same day it occurs, the number of that day's record must be entered in the space provided on records for all succeeding days, until the variance is resolved.

e. Closing Section

Sign the record at the end of the workday and submit it to the government inspector.

4.6 WORK ITEMS

(Work Item numbers correspond to Work Items under "Execution" on AF Form 1063)

WORK ITEM 1

Do not expose materials to moisture in any form before, during, or after delivery to the site.

Action: Inspect materials upon delivery for intact manufacturer's shipping containers. Verify that the vehicle delivering materials provided adequate cover for protection of materials. Inspect materials for evidence of contact with moisture before acceptance. Inspect job site storage; ascertain enclosed storage to protect materials from moisture from any source. Observe material handling from storage areas to roof. Delivery to job site requires the same attention as delivery to storage area. Mark conspicuously all materials exposed to any form of moisture and have them permanently removed from the project site.

WORK ITEM 2

Rolls of membrane shall be lifted using slings or by the ends. Chains, cables or similar small diameter materials shall not be used unless padded with two layers of membrane.

Action: Check lifting points for evidence of cuts or punctures on padding material or packaging. If damage is evident, very closely examine areas under damage for evidence of cuts or pinholes.

WORK ITEM 3

Do not apply roofing system components if moisture in any form can be seen or felt on the substrate to which the components will be applied. Insulation and/or substrate shall be free from debris, sharp objects, films, or other contaminants.

Action: Ascertain no moisture is on deck or insulation layers before applying subsequent materials. If there are objects present which present a physical danger to the membrane, they shall be swept off or smoothed out. Water shall be broomed or pumped off and the surface allowed to dry before laying insulation or membrane. Other contaminants which may be present and not addressed in the specification shall be prevented from coming into physical contact with the sheet.

WORK ITEM 5

Ensure that insulation boards are adequately secured.

Action: Ensure that the first layer of insulation is fully secured to the deck with mechanical fasteners in accordance with Factory Mutual I-90 and membrane manufacturer's requirements. Measure the distance from the outer row of fasteners to the perimeter. Count and locate fasteners with respect to insulation boards. Test bond of insulation boards by trying to lift them after installation. Materials that are readily lifted without fracture are not securely fastened.

WORK ITEM 6

Provide method to move rolls without damaging membrane.

Action: Use carts or buggies. If it is necessary to move rolls without carts or buggies, the area over which the roll will be moved shall be cleared and inspected for the presence of objects which could puncture the membrane. After rolling rolls, inspect foremost outside layer for any evidence of punctures or damage.

WORK ITEM 7

Allow panels to relax in place for 30 minutes minimum prior to seaming.

Action: Wait 30 minutes. Panels seamed in place too soon shall be cut loose, allowed to relax, and then stripped back in place.

WORK ITEM 8

Apply elastomeric membrane according to manufacturer's current technical installation manual for the system to be installed.

Action: Refer to manufacturer's manual and ascertain the proper number, type, and length of fasteners are being used correctly, the correct laps are being used at all splices, that volatiles are allowed to dry off cements before jointing (if used), that sealing/fastening tapes are applied properly, and edge/lap seal is adequate and continuous.

WORK ITEM 9

Clean seam area using techniques required by manufacturer's specification.

Action: This is the most critical factor and should be monitored very carefully. Lap adhesion depends on proper cleaning of both mating surfaces. If incorrectly cleaned, seams are to be taken apart and relapped for splicing. A 6-inch wide uncured flashing shall be centered over all field seams.

WORK ITEM 10

Pourable sealer shall be set up firm and have a crown to drain.

Action: Use a low speed on an electric drill to assure complete mixing of resin and hardener.

WORK ITEM 11

Probe seams for defective adhesion.

Action: Check the outside edge of the seam using a pointed metal probe along the length of the lap area prior to strip-in of seam. The completed lap shall be visually free of any voids, fishmouths, wrinkles, or unattached areas, and shall lay flat.

WORK ITEM 12

Base flashing shall be installed with no bridging.

Action: Flashings having a bridge wider than 1/2 inch shall be cut and recovered or replaced.

WORK ITEM 13

If traffic of any kind over the partially or fully completed roofing is unavoidable, provide and use adequate plank or plywood protection for the roofing.

Action: Inspect activities and methods used to transport materials over the completed or partially completed roofing system. Check adequacy of planks or plywood to protect system.

WORK ITEM 14

Do not load or permit any part of a structure to be loaded with a weight that will adversely affect the structure's safety.

Action: Assure that runways (such as wood planks or plywood) are used to distribute the load of materials and equipment hauling over the deck so as not to cause deflection of the deck. Check for broken welds on bends in metal decking because of materials or equipment handling.

WORK ITEM 15

Execute the work so that each area of the installation is completed ("dried in") on the same day it is begun. Included are all flashings and related parts to complete the assembly.

Action: Determine the area of work planned and ascertain that enough materials are at hand to complete it. Inspect work at day's end, verifying completion to tie-in point.

WORK ITEM 16

Install temporary water cutoffs and tie-ins at the end of each work day. Remove cutoffs and tie-ins on resuming work day so that all vertical faces of insulation are exposed.

Action: Observe tie-ins to verify that insulation joints are staggered and no moisture has intruded. Complete all field seams, and secure and make watertight all membrane terminations before the end of each work day.

WORK ITEM 17

Except for expedient temporary work, do not proceed with roofing work during inclement weather.

Action: During bad weather, ascertain that work being done is only temporary and protects the facility and previously completed roofing system. Assure that all temporary work is removed before installation of permanent components when work is resumed.

- - o 0 o - -

ATTACHMENT NO. 1

ELASTOMERIC MANUFACTURER
CERTIFICATION

The following statement is required from the elastomeric manufacturer. The elastomeric manufacturer is defined as the roof membrane product manufacturer who may or may not manufacture the other system components, such as metal or other flashings, insulation, and fasteners.

This is to advise that _____ (roofing contractor/ subcontractor) is an approved applicator of our roofing system and is capable of obtaining our 15-year labor and materials warranty. We will execute the Air Force 15-year warranty certification upon the successful completion of all work in accordance with the project plans and specifications or as modified to comply with our 15-year roofing system requirements, whichever is most stringent.

We have reviewed the System Summary Sheet for Project No. _____ at _____ (location). We certify that the roofing systems listed below and described in the attached product literature are suitable for use with the roof system construction specified for this project as it relates to normal wear and exposure to the weather.

We certify that the specified insulations are compatible with the membrane and would qualify for our 15-year materials and labor warranty. We accept responsibility for defects or failure of, or improper application of, roof insulation used as a base over which the roofing is applied, except the roof deck.

We understand that proposed changes relating to the roofing system will be submitted for our review and acceptance. A signed copy approving the concept of the change will be returned to the Contracting Officer.

Building Number(s)	Roofing System Designation * (Membrane)	(Insulation)
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

_____ _____
_____

*List manufacturer's name and product designation

A technical representative can be made available to attend the roofing conference to discuss proper installation procedures for our EDPM system. A technical representative will also be available to make at least one in-progress inspection and one final acceptance inspection of the installation.

Roofing Manufacturer

Firm Name: _____

Address: _____

Authorized Representative

Signature:
_____

Printed or Typed Name:
_____

Signed This _____ Day of
_____19_____

2 Atch
1. EPDM System Literature
2. Insulation Literature

ATTACHMENT NO. 2

SYSTEM SUMMARY SHEET

(To be completed and signed by an approved roofing contractor and the elastomeric (EPDM) manufacturer and submitted to the Contracting Officer at the roofing conference.)

This is to notify you that we shall apply for your full 15 year labor and materials warranty for the following project.

Solicitation No.: _____ Name of Building: _____

Address sf Building: _____

Type and Use of Building: _____

[ ] New Building [ ] Recover [ ] Tear Off

No. of Squares: _____ Mfg Spec No.: _____

Feet of Flashing: _____ Mfg Spec No.: _____

Description of Project: _____

Roof Slope: _____ Does the Roof have adequate drainage? [ ] Yes [ ] No

Deck: [ ] Steel Gauge: _____ Joist Spacing: _____
Width of Rib: _____

[ ] Wood Type: _____ Thickness: _____
Joist Spacing: _____

[ ] Lightweight Concrete Type: _____
Min. Thickness: _____

[ ] Concrete Type: _____ [ ] Structural] Wood Fiber
Trade Name: _____

[ ] Gypsum Type: _____

[ ] Other (Specify): _____

Vapor Retarder: [ ] No [ ] Yes [ ] Old [ ] New
Type:
_____

New Insulation: [ ] Fiberboard [ ] Perlite [ ] Isocyanurate [ ] EPS
[ ] Urethane [ ] Cellular Glass [ ] Fiberglass
[ ] Phenolic [ ] Other
_____
Attachment: [ ] Mechanical Fastener Type:
_____
[ ] Hot Asphalt
Insulation Manufacturer: _____ No. of Layers: ____
Thickness:
_____

Atch 2

ATTACHMENT NO. 2

Recover Info: Number of Existing Roofs? _____
Existing Surface: [ ] Smooth [ ] Gravel [ ] Cap Sheet

Loose to be Removed? [ ] Yes [ ] No
Wet Insulation? [ ] Yes [ ] No
Waterlogged Areas to be Removed? [ ] Yes [ ] No
Roof Vents to be Used? [ ] Yes [ ] No Spacing: _____

This job will be completed in accordance with the contract specifications or the latest issue of the EPDM manufacturer's "Commercial Roofing Specifications" manual, whichever is most stringent, and we will use only the undersigned manufacturer's products unless other products are approved by the manufacturer.

We plan to start this job on _____.
We plan to complete the job on _____.

Name of Roofing Contractor/Subcontractor: _____.

Address:_____Phone No.:_____

Signature of Company Official: _____-_____

Title:_____Print Name:_____

We acknowledge your notification that the U.S. Government's 15-year EPDM warranty will be required on the roof described above and will sign and issue this warranty/guaranty to the Government upon your successful completion of this project. There will be a charge to you of $_____.

Manufacturer:_____
_____

Authorized Representative:_____Date_____
__

Atch 2

ATTACHMENT NO. 3

APPOINTMENT OF QUALITY CONTROLLER

_____(Name)___ is appointed as Quality Controller on Project _____ with the authority to regulate the quality of the work so that it conforms to the contract. The Quality Controller is authorized to order discontinuance of any operation causing nonconforming work.

The Quality Controller is experienced in the supervision and inspection of EPDM construction similar to that required in this contract. The Quality Controller understands all requirements of these specifications.

Name of Firm:
_____

Address:
_____
_____

Telephone:
_____
__

Authorized Representative's Signature:
_____

Printed or Typed Name:
_____

Date:
_____

I acknowledge receipt of this letter.

Quality Controller's Signature:
_____

Printed or Typed Name:
_____

Date:
_____

ATTACHMENT NO. 4

ETHYLENE PROPYLENE DIENE MONOMER (EPDM) 15-YEAR LABOR AND MATERIAL WARRANTY

WARRANTY COVERAGE

This Ethylene Propylene Diene Monomer (EPDM) System is delivered to the United States Government subject to a full material and workmanship warranty for 15 years that guarantees that the manufacturer will pay all costs necessary to maintain the EPDM roofing membrane and flashing system in a watertight condition during the life of the warranty.

The specified roof system is equal to and comparable to our (manufacturer's name) 15-year system design and the insulations specified are compatible with our material. As the manufacturer of this system, we also accept responsibility for making repairs to the roofing system at no additional cost to the government, to correct defective materials and workmanship down to the structural deck.

If the manufacturer fails to make required emergency and permanent repairs during the warranty period, as stated after notice by telephone from the Contracting Officer, the Government may have the work done by other authorized applicators and charge the cost to the manufacturer. The warranty provisions of this contract apply notwithstanding Government inspection and acceptance. A separate warranty is required for each building. Failure to perform the work, resulting in the Government having the work performed, will not void this warranty.

TERMS, CONDITIONS, LIMITATIONS :

Emergency repairs shall be made by the manufacturer or his licensed applicator within 48 hours of receipt of notice by telephone from the Contracting Officer and weather permitting, the manufacturer agrees to permanently repair the affected areas within 30 days by restoring them to a watertight condition, without cost to the Government. If it is determined that leaks were caused by either an exclusion from coverage or a specific condition listed below, the manufacturer will repair the defects and payment will be made by the Government based on invoices supplied by the manufacturer.

The monetary liability to the manufacturer for replacement of a defective system is limited to the cost of the original installation of the total roof system.

EXCLUSIONS FROM COVERAGE

1. Natural disasters, acts of God (lightning, hurricanes, tornadoes, sustained winds exceeding 72 MPH as recorded at the nearest meteorological center, earthquakes, hail.)

EXCLUSIONS FROM COVERAGE (cont'd)

2. Acts of negligence or abuse and misuse by Government personnel, accidents, vandalism, civil disobedience, war, or damage caused by falling objects.

3. Damage by structural failure, settlement, movement, distortion, warpage, or displacement of structure.

4. Failure of material or flashing caused by movement of metal work not supplied by manufacturer issuing the warranty.

5. Leaks caused by repairs or alterations of roof system or installation of structures, fixtures or utilities on or through roof without prior written approval of manufacturer.

6. Storage of material on roof.

7. Moisture entering roof system through walls, coping, or any part of building structure except the roof, including from adjacent building.

8. Fire.

9. Faulty construction or design of building, including parapet wall, copings, chimneys, skylights, vents, or of structural roof deck.

10. Infiltration or condensation of moisture in or through underlying area; vapor condensation beneath the roof greater than the acceptable ambient moisture content for the given material as established by the appropriate American Society for Testing and Materials (ASTM) standard in effect at the time of installation.

11. Under no circumstances is the manufacturer responsible for damages to the building, its contents or structural roof deck.

12. Membrane deterioration due to chemical attack from: HVAC oil, lubricating oil, solvents, or other petroleum products.

SPECIFIC CONDITIONS THAT VOID THE WARRANTY

1. Failure by the owner to use reasonable care in maintenance; failure to follow manufacturer's written maintenance instructions.

2. Failure of owner to make repairs to leaks not covered by manufacturer's warranty.

3. Repair work by any contractor other than EPDM manufacturer's licensed applicator or use of unapproved material.

4. Changes in building usage which may affect roof performance unless approved in writing by the manufacturer prior to such change.

Atch 4

DETERMINATION OF RESPONSIBILITY

A Government representative will call the manufacturer immediately when a leak is discovered. Receipt of notice by telephone or in writing from the Contracting Officer is evidence that the Contracting Officer has had the roof examined by a technically qualified representative of the Government and has determined, based on this examination, that none of the above exclusions or specific conditions apply and the manufacturer is obligated to make the repairs.

After completion of the 48 hour emergency repair, the manufacturer, to avoid application of the warranty, must notify the Contracting Officer in writing of the existence of an exclusion stated herein. Failure to provide such notice will preclude the manufacturer from later disputing the coverage of the warranty. The burden to establish the existence of an exclusion or specific condition affecting the warranty is on the manufacturer.

After the occurrence of an exclusion from coverage or a specific condition which renders the warranty ineffective, the warranty shall be allowed to continue as long as the Government returns the roofing system to its original condition and the manufacturer is allowed to make or oversee the repair. The manufacturer and his authorized installer will be paid for time and transportation to make or supervise the non-warranty repair.

BENEFICIARY

The warranty period starts on the date the roofing system (work) is accepted by the Government from the roofing manufacturer's technical representative and the roofing contractor.

It is understood by the manufacturer and his licensed/approved applicator (Contractor) that the warranty provided herein shall be for the benefit of the United States Government.

BURDEN OF PROOF

The manufacturer shall have the burden of proving the existence of a condition which established an exclusion from coverage, or which would render the warranty ineffective or null and void.

OTHER WARRANTIES

The warranty contained herein shall be in addition to and not in lieu of any warranty otherwise applicable to the work or materials used in the contract.

SIGNATURE

Manufacturer Firm Name:
_____

Address:
_____

Authorized Representative's Signature:
_____

Date:
_____

Authorized Representative's Name:
_____

Title:
_____

Manufacturer's Warranty/Serial
Number for Building Number:
_____

Located at:
_____

Warranty/Guaranty Expiration Date:
_____

ATTACHMENT NO. 5

ROOFING MEMBRANE SAMPLE IDENTIFICATION TAGS

Include this attachment in the envelope with sample. Use indelible ink or typing.

Sample No.: _____ Proj No.: _____

Air Base: _____ Bldg No.: _____

Elastomeric Membrane Manufacturer: _____

Elastomeric Membrane Type: _____

Elastomeric Membrane Thickness: _____

Elastomeric Membrane Lot Number: _____

ATTACHMENT NO. 6

AS-BUILT ROOF SYSTEM SUMMARY

After completion of construction, accurately fill in the information required on this sheet. If more than one system applies to the same building, complete one sheet for each system. Submit in quadruplicate before final acceptance.

Bldg No.: _____ Project: _____

_____ AFB

Total project area in square feet:

_____

Building area where this system is installed:
_____
_____
_____.

Deck Type: _____ Deck Slope:
_____

Underlayment Components (Type & Number):

_____

Underlayment Attachment Method:

_____

Insulation:

Type:
_____
Manufacturer:
_____
First Layer: Thickness: _____ Attachment:
_____
Second layer: Thickness: _____ Attachment:
_____

Elastomeric Membrane:

Manufacturer:
_____
System Designation:
_____
Type of Elastomer:
_____
Type of Adhesive:
_____
Type of Lap Adhesive:
_____

Type of Lap Sealant:
_____

Was this a new system installed over existing roof?
_____

Roof Completion Date:
_____

Roofing Contractor (Name):
_____

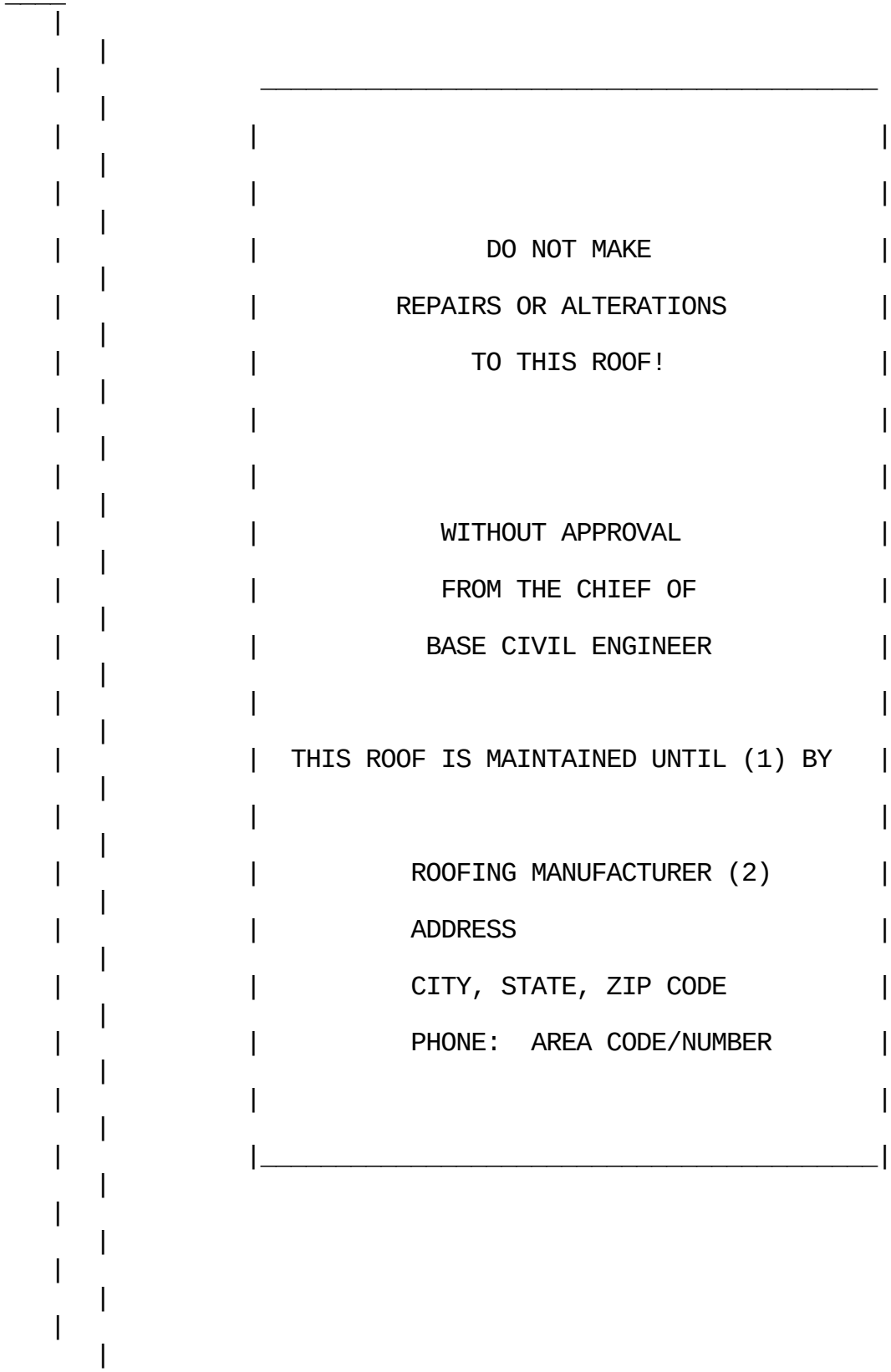
Address:
_____

Telephone: Day: _____ 24 Hour:
_____

Atch 6

ATTACHMENT NO. 7

SIGNS TO BE POSTED FOR ROOFING WARRANTY



SIGNS - TO BE POSTED AS SPECIFIED

(1) Insert warranty expiration date 15 years from final acceptance.

(2) Insert the Roofing Manufacturer's name, address, and phone number.

Atch 7

ATTACHMENT NO. 8

QUALITY CONTROL RECORD
(AF FORM 1063)

Record Number: _____ Date: _____

Contract Number: _____

Building Name: _____

Weather (Describe) _____ Average Temp.: _____

Roofing Crew: Start Time _____ Stop Time _____

Quality Controller: Start Time _____ Stop Time _____

Total Roof Area (Squares) _____
Roof Area: Previously Completed _____; Completed Today _____

Number of Test Samples Removed _____

PRODUCTS

COMPONENTS	COMPLIES	VARIES	NOT APPLICABLE
Vapor Retarder			
Insulation			
Membrane			
Composition Flashing			
Sheet Metal			
Fasteners			

*	*	*	*
Wood Items	*	*	*
*	*	*	*
Sealants	*	*	*
*	*	*	*
Expansion Joints	*	*	*
*	*	*	*
All Other Materials	*	*	*
*			

Atch 8

AF FORM 1036
QUALITY CONTROL RECORD (Continued)

Record Number: _____ Date: _____

EXECUTION

WORK ITEMS.

1. MATERIAL MOISTURE CONTENT.
|COMPLIES |VARIES |NOT APPLICABLE |

2. MATERIAL IDENTIFICATION/HANDLING.
|COMPLIES |VARIES |NOT APPLICABLE |

3. SUBSTRATE MOISTURE CONTENT
|COMPLIES |VARIES |NOT APPLICABLE |

4. SUBSTRATE PREPARATION
|COMPLIES |VARIES |NOT APPLICABLE |

5. INSULATION PREPARATION
|COMPLIES |VARIES |NOT APPLICABLE |

6. TRANSPORTING MEMBRANE ROLLS
|COMPLIES |VARIES |NOT APPLICABLE |

7. MEMBRANE PREPARATION
|COMPLIES |VARIES |NOT APPLICABLE |

8. MEMBRANE APPLICATION
|COMPLIES |VARIES |NOT APPLICABLE |

9. MEMBRANE SEAM CLEANING
|COMPLIES |VARIES |NOT APPLICABLE |

10. SEAM SEALER
|COMPLIES |VARIES |NOT APPLICABLE |

11. MEMBRANE SEAM INSTALLATION
|COMPLIES |VARIES |NOT APPLICABLE |

12. FLASHING INSTALLATION
|COMPLIES |VARIES |NOT APPLICABLE |

13. ROOF TRAFFIC
|COMPLIES |VARIES |NOT APPLICABLE |

14. PROTECTING COMPLETED WORK
|COMPLIES |VARIES |NOT APPLICABLE |

15. WEATHERING-IN OF DAY'S WORK

COMPLIES	VARIES	NOT APPLICABLE

Atach 8

AF FORM 1036
QUALITY CONTROL RECORD (Continued)

Record Number: _____ Date: _____

16. TEMPORARY CUTOFFS AND TIE-INS
|COMPLIES |VARIES |NOT APPLICABLE |

17. INCLEMENT WEATHER
|COMPLIES |VARIES |NOT APPLICABLE |

EXPLAIN VARIANCE. (If none write NONE)

_____

UNRESOLVED VARIANCES ON RECORD NOS.

_____

ACTION TAKEN TO RESOLVE VARIANCE.

_____

I CERTIFY THAT I HAVE PERSONALLY PERFORMED THE REQUIRED TESTS AND MEASUREMENTS AND ATTEST THAT THIS QUALITY CONTROL RECORD IS AN ACCURATE RECORD OF ALL WORK ACCOMPLISHED TODAY.

QUALITY CONTROLLER
(Signature)_____

RECEIVED BY
(Signature)_____DATE_____

Atch 8

FW-07601 AF
CEGS-07600
(January 1989)
w/AFR 88-15 and
AF ETL 87-8
w/Not # 5
(November 1992)
Superseding
FW-07601 AF
(27 Nov 91)
typed 18 May 93

SECTION 07601 - SHEET METALWORK, GENERAL

PART 1 - GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AIR MOVEMENT AND CONTROL ASSOCIATION (AMCA)

AMCA 500	(1989) Test Methods for Louvers, Dampers, and Shutters

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 526	(1990) Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Commercial Quality
ASTM B 209	(1990) Aluminum and Aluminum-Alloy Sheet and Plate
ASTM B 221	(1991) Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes
ASTM B 486	(1974; R 1985) Paste Solder

SHEET METAL AND AIR CONDITIONING CONTRACTORS NATIONAL ASSOCIATION (SMACNA)

SMACNA-02	(1987; 4th Ed) Architectural Sheet Metal Manual

1.2 GENERAL REQUIREMENTS

Sheet metalwork shall be accomplished to form weathertight construction. Work shall be installed without waves, warps, buckles, fastening stresses or distortion and shall allow for expansion and contraction. Cutting, fitting, drilling, and other operations in connection with sheet metal required to accommodate the work of other trades shall be performed by sheet metal mechanics. Exposed edges shall be hemmed. Bottom edges of exposed vertical surfaces shall be angled to form drips. Flashing at the end of a run shall be formed into a three dimensional configuration to direct water to the outside of the system. Joints shall be installed as specified in TABLE 3. Accessories and other items essential to complete the sheet metal installation, though not specifically indicated or specified, shall be provided. Installation of sheet metal items used in conjunction with roofing shall be coordinated with roofing work to permit continuous roofing operations. Factory-fabricated components shall be packed in cartons marked with the manufacturer's name or trademark. Bulk materials from which items are field fabricated shall have manufacturer's name or trademark printed or embossed at frequent intervals to permit easy identification. Sheet metalwork pertaining to heating, ventilating, and air conditioning is specified in other sections.

1.3 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01300 SUBMITTAL DESCRIPTIONS:

SD-04 Drawings\

Sheet Metal\; *GA*\.

Drawings showing weights, gauges, or thickness of sheet metal; type of material; joining, expansion-joint spacing, and fabrication details; and installation procedures. Materials shall not be delivered to the site until after the approved detail drawings have been returned to the Contractor.

SD-14 Samples\

Materials\; *FIO*\.

Samples of materials proposed for use, upon request.

SD-08 Statements\

Contractor Quality Control\; *FIO*\.

Quality Assurance Plan, including a checklist of points to be observed, prior to start of roofing work.

1.4 DELIVERY, STORAGE, AND HANDLING

Materials shall be adequately packaged and protected during shipment and shall be inspected for damage, dampness, and wet-storage stains upon delivery to the jobsite. Materials shall be clearly labeled as to type and manufacturer. Sheet metal items shall be carefully handled to avoid damage. Materials shall be stored in dry, weathertight, ventilated areas until immediately before installation.

PART 2 - PRODUCTS

2.1 MATERIALS

Materials shall conform to the requirements specified below, and those given in TABLE 1. Where TABLE 1 lists more than one metal for a particular item, any listed metal may be used unless otherwise specified. Different items need not be of the same metal.

2.1.1 Aluminum Extrusions

ASTM B 221, Alloy 6063, Temper T5.

2.1.2 Fasteners

Materials shall conform to TABLE 2. Fasteners shall be the best type for the application.

2.1.3 Plastic Hardsetting Sealant

As recommended by aluminum manufacturer.

2.1.4 Sheet Metal

2.1.4.1 Aluminum Alloy Sheet and Plate

ASTM B 209, form, alloy, and temper appropriate for use.

2.1.4.2 Galvanized Steel

ASTM A 526 with coating designation G90, mill phosphatized.

2.1.5 Solder

ASTM B 486, for use with galvanized steel.

2.2 SEALANTS AND SEALING COMPOUNDS

Sealants and sealing compounds referred to hereinafter are specified in Section 07920 JOINT SEALING.

PART 3 - EXECUTION

3.1 PROTECTION OF ALUMINUM AND GALVANIZED STEEL

Aluminum and galvanized steel shall not be used where it will be in contact with copper or where it will contact water which flows over copper surfaces. Aluminum and galvanized steel that will be in contact with wet or pressure-treated wood, mortar, concrete, masonry, or ferrous metals shall be protected against galvanic or corrosive action by one of the following methods:

3.1.1 Paint

Aluminum and galvanized steel surfaces to be protected shall be solvent cleaned and given a coat of zinc-molybdate primer and one coat of aluminum paint. Aluminum paint shall conform to Section 09900 PAINTING, GENERAL.

3.1.2 Nonabsorptive Tape or Gasket

Nonabsorptive tape or gasket shall be placed between the adjoining surfaces and shall be cemented to the aluminum or galvanized steel surface using a cement compatible with aluminum or galvanized steel.

3.2 SOLDERING, RIVETING, SEAMING, AND SEALING

3.2.1 Soldering

Soldering shall apply to indicated galvanized steel items. Edges of sheet metals, except lead coated material shall be pretinned before soldering is begun. Soldering shall be done slowly with well heated soldering irons so as to thoroughly heat the seams and completely sweat the solder through the full width of the seam. Soldering shall follow immediately after application of the flux. Upon completion of soldering, the acid flux residue shall be thoroughly cleaned from the

sheet metal with a solution of washing soda in water and rinsed with clean water.

3.2.1.1 Damaged Galvanized Coating

Where galvanized coating has been damaged by soldering, damaged areas shall be painted with an approved galvanizing repair paint having a high-zinc dust content.

3.2.2 Riveting and Sealing

Joints in aluminum sheets 0.040 inch or less in thickness shall be made mechanically and sealed with the sealant specified.

3.2.3 Seams

Flat-lock seams shall finish not less than 1-inch wide. Unsoldered plain-lap seams shall lap not less than 3 inches unless otherwise specified. Flat seams shall be made in the direction of the flow.

3.3 CLEATS

A continuous cleat shall be provided where indicated or specified to secure loose edges of the sheet metalwork. Butt joints shall be spaced approximately 1/8-inch apart. The cleat shall be fastened to the supporting construction with nails evenly spaced not over 12 inches on centers. Where the fastening is to be made to concrete or masonry, screws shall be used and shall be driven in expansion shields set in concrete or masonry. The cleat for fascia cap anchorage shall be installed to extend below the supporting construction to form a drip and to allow the flashing to be hooked over the lower edge at least 3/4 inch. The cleat shall be of sufficient width to provide adequate bearing area to insure a rigid installation.

3.4 DOWNSPOUTS

Downspouts shall be set plumb and not less than 1 inch from the wall. Leaders shall connect gutters on overhanging eaves to downspouts. Leaders shall be set with a slope not less than 1/16-inch per foot or more than 30 degrees below a horizontal line. Leaders shall fit over the outlet tube in gutter bottom and shall fit into and be riveted to the downspout. Rivet spacing shall be not more than 2 inches. Strainers shall be set loosely in the eave tube opening in gutter. Joints between lengths of downspouts shall be made

by telescoping the end of the upper lengths at least 3/4 inch into the lower length. Downspouts terminating at splash blocks shall be provided with stock elbow-type fittings. Downspout hangers shall be provided adjacent to the joint at the top of each section of downspout except that the bottom section shall have an additional strap adjacent to the bottom joint when splash blocks are required. Hangers shall be 1/16- by 1-inch flat stock of the same material as the downspout.

3.5 EXPANSION JOINTS

Expansion joints shall be provided at 40-foot intervals for galvanized steel and at 32-foot intervals for aluminum, except that where the distance between the last expansion joint and the end of the continuous run is more than half the required interval spacing an additional joint shall be provided. Joints shall be evenly spaced. Fasciae shall have expansion joints at not more than 12-foot spacing.

3.6 FLASHINGS

Flashings shall be installed where indicated above intersections of roof with vertical surfaces. Corner units shall have mitered joints, shall be installed with 3-inch lap joint over flashings on each side.

3.7 FASCIA

Sheets shall be fabricated without longitudinal joints. Provision for expansion shall be provided at joints. Internal and external corner units with mitered joints shall be provided.

3.7.1 Sheets, Smooth

The lower edge of fascia shall be hooked 3/4 inch over a continuous cleat and bent outward at an angle of 30 degrees.

3.8 GUTTERS

Gutters shall terminate at least 1/2 inch away from vertical surfaces. Gutter brackets and spacers shall be fastened to roof nailer by screws or deformed shank-type nails and shall interlock with or be fastened to the leading edge of gutter. Gutter spacers shall be 1/16 inch by 1 inch flat-stock of the same material as the gutter. Brackets and spacers shall be alternated at not more than 36 inches on centers. Gutters shall be hung with high points at ends or equidistant from

downspouts and shall have a slope of not less than 1/16 inch per foot.

3.9 LOUVERS

Louvers shall be fabricated of aluminum to the dimensions indicated and in accordance with the details shown in SMACNA-02 Architectural Sheet Metal Manual. Blades shall be accurately fitted and firmly secured to the frame by riveting and sealing. The edges of louver blades shall be folded or beaded for rigidity, and baffled to exclude driving rain. Louvers shall be provided with insect screens as indicated. Louvers shall bear the AMCA Certified Ratings Seal for air performance and water penetration ratings as described in AMCA 500.

3.11 Trim

Brake metal shapes of aluminum shall be used to form accent bands around building as indicated on Drawings. Retainer component of assembly shall be fastened to the supporting construction with screws at indicated spacing.

3.10 CONTRACTOR QUALITY CONTROL

The Contractor shall establish and maintain a quality control procedure for sheet metal used in conjunction with roofing to assure compliance of the installed sheet metalwork with the contract requirements. Any work found not to be in compliance with the contract shall be promptly removed and replaced or corrected in an approved manner. Quality control shall include, but not be limited to, the following

a. Observation of environmental conditions; number and skill level of sheet metal workers; condition of substrate.

b. Verification of compliance of materials before, during, and after installation.

c. Inspection of sheet metalwork, for proper size and thickness, fastening and joining, and proper installation. The actual quality control observations and inspections shall be documented and a copy of the documentation furnished to the Contracting Officer at the end of each day.

TABLE 1. SHEET METAL WEIGHTS, THICKNESSES, AND GAGES

Item Description	Aluminum, inch	Galvanized steel, gage
EXPOSED SHEET METAL		
Cleats (Continuous)	---	20
Retainer (Continuous)	0.050	
Downspouts, heads and leaders	---	24
Flashings	---	20
Fascia cap sheets, smooth	---	20
Gutters (girth):		
Up to 15 inches	---	26
15 to 20 inches	---	24
20 to 25 inches	---	22
25 to 30 inches	---	20
Gutter brackets (girth):		
Up to 15 inches	---	1/8" x 1"
50 to 20 inches	---	1/8" x 1-1/2"
20 to 24 inches	---	1/8" x 2"
Gutter cleats and cover plates	---	26
Strainers (wire gage)	---	No. 12
Expansion Joint Curb Clip	---	1/8" x 8"
Cradle Support	---	3/16" x 1"
Louvers (Width, inches):		
Up to 24 inches	.040	---
24 to 36 inches	.040	---
36 to 48 inches	.064	---
48 to 60 inches	.064	---
Trim	0.050	---

TABLE 2. FASTENER MATERIALS

To prevent corrosion, the indicated fastener materials shall be used with the following sheet metals:

Sheet Metal	Nails	Screws	Rivets	Bolts
Aluminum	Aluminum	Aluminum	Aluminum	Aluminum
Galvanized Steel	Galvanized Steel	Galvanized Steel	Galvanized Steel	Galvanized Steel

TABLE 3. SHEET METAL JOINTS

Item Designation	Type of Joint: Galvanized Steel	Type of Joint: Aluminum	Remarks
Cleats (continuous	Butt with 1/4-inch space	---	---
Flashings	Butt with 1/4-inch space	---	Use 6-inch cover plate
Trim	---	Butt with 1/4-inch space	Use 6-inch cover plate
Fascia cap	Butt with 1/4-inch space	---	Use cover plate sized and located as indicated
Gutters	1-1/2-inch lap, riveted and soldered	---	

- - o 0 o - -

CEGS-07920
(May 1994)
Superseding
CEGS-07920
(March 1989)
typed 8 Nov 94

SECTION 07920 - JOINT SEALING

PART 1 - GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 920	(1987) Elastomeric Joint Sealants
ASTM D 217	(1988) Cone Penetration of Lubricating Grease
ASTM D 1565	(1981; R 1990) Flexible Cellular Materials - Vinyl Chloride Polymers and Copolymers (Open-Cell Foam)
ASTM E 84	(1991a) Surface Burning Characteristics of Building Materials

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with SECTION 01300 SUBMITTAL DESCRIPTIONS:

SD-01, Data\

Backing\; *FIO*\.

Bond-Breaker\; *FIO*\.

Sealant\; *FIO*\.

Manufacturer's descriptive data including storage requirements, shelf life, curing time, instructions for mixing and application, and primer data (if required). A copy of the Material Safety Data Sheet shall be provided for each solvent, primer or sealant material.

SD-13, Certificates\

Sealant\; *FIO*\.

Certificates of compliance stating that the materials conform to the specified requirements.

1.3 ENVIRONMENTAL REQUIREMENTS

The ambient temperature shall be within the limits of 40 to 90 degrees F when the sealants are applied.

1.4 DELIVERY AND STORAGE

Materials shall be delivered to the job in the manufacturer's original unopened containers. The container label or accompanying data sheet shall include the following information as applicable: manufacturer, name of material, formula or specification number, lot number, color, date of manufacture, mixing instructions, shelf life, and curing time at the standard conditions for laboratory tests. Materials shall be handled and stored to prevent inclusion of foreign materials. Materials shall be stored at temperatures between 40 and 90 degrees F unless otherwise specified by the manufacturer.

PART 2 - PRODUCTS

2.1 BACKING

Backing shall be 25 to 33 percent oversize for closed cell material, unless otherwise indicated.

2.1.1 PVC Backing

Polyvinyl chloride (PVC) backing A shall be ASTM D 1565, Grade VO 12 closed-cell foam, round cross-section.

2.2 BOND-BREAKER

Bond-breaker shall be as recommended by the sealant manufacturer to prevent adhesion of the sealant to backing or to bottom of the joint.

2.3 PRIMER

Primer shall be non-staining type as recommended by sealant manufacturer for the application.

2.4 ELASTOMERIC SEALANTS

Elastomeric sealants shall conform to ASTM C 920 and the following:

c. Silicone Sealant A: Silicone sealant, Type S, Grade NS, Class 25, Use NT, G, A, O.

2.5 ACOUSTICAL SEALANT

Rubber or polymer-based acoustical sealant shall have a flame spread of 25 or less and a smoke developed rating of 50 or less when tested in accordance with ASTM E 84. Acoustical sealant shall have a consistency of 250 to 310 when tested in accordance with ASTM D 217, and shall remain flexible and adhesive after 500 hours of accelerated weathering as specified in ASTM C 734, and shall be non-staining.

2.6 SOLVENTS AND CLEANING AGENTS

Solvents, cleaning agents, and accessory materials shall be provided as recommended by the manufacturer.

PART 3 - EXECUTION

3.1 GENERAL

3.1.1 Surface Preparation

The surfaces of joints to be sealed shall be dry. Oil, grease, dirt, chalk, particles of mortar, dust, loose rust, loose mill scale, and other foreign substances shall be removed from surfaces of joints to be in contact with the sealant. Oil and grease shall be removed with solvent and surfaces shall be wiped dry with clean cloths.

3.1.2 Concrete and Masonry Surfaces

Where surfaces have been treated with curing compounds, oil, or other such materials, the materials shall be removed by sandblasting or wire brushing. Laitance, efflorescence and loose mortar shall be removed from the joint cavity.

3.1.3 Steel Surfaces

Steel surfaces to be in contact with sealant shall be sandblasted or, if sandblasting would not be practical or would damage adjacent finish work, the metal shall be scraped and wire brushed to remove loose mill scale. Protective coatings on steel surfaces shall be removed by sandblasting or by a solvent that leaves no residue.

3.1.4 Aluminum Surfaces

Aluminum surfaces to be in contact with sealants shall be cleaned of temporary protective coatings. When masking tape is used for a protective cover, the tape and any residual adhesive shall be removed just prior to applying the sealant. Solvents used to remove protective coating shall be as recommended by the manufacturer of the aluminum work and shall be non-staining.

3.1.5 Wood Surfaces

Wood surfaces to be in contact with sealants shall be free of splinters and sawdust or other loose particles.

3.2 APPLICATION

3.2.1 Masking Tape

Masking tape shall be placed on the finish surface on one or both sides of a joint cavity to protect adjacent finish surfaces from primer or sealant smears. Masking tape shall be removed within 10 minutes after joint has been filled and tooled.

3.2.2 Backing

Backing shall be installed to provide the indicated sealant depth. The installation tool shall be shaped to avoid puncturing the backing.

3.2.3 Bond-Breaker

Bond-breaker shall be applied to fully cover the bottom of the joint without contaminating the sides where sealant adhesion is required.

3.2.4 Primer

Primer shall be used on concrete masonry units, wood, or other porous surfaces in accordance with instructions furnished with the sealant. Primer shall be applied to the joint surfaces to be sealed. Surfaces adjacent to joints shall not be primed.

3.2.5 Sealant

Sealant shall be used before expiration of shelf life. Multi-component sealants shall be mixed according to manufacturer's printed instructions. Sealant in guns shall be applied with a nozzle of proper size to fit the width of joint. Sealant shall be forced into joints with sufficient pressure to expel air and fill the groove solidly. Sealant depth shall be as recommended by sealant manufacturer. Sealant shall be installed without displacing the backing. Unless otherwise indicated, specified, or recommended by the manufacturer, the installed sealant shall be tooled so that the surface is uniformly smooth and free of wrinkles and to assure full adhesion to the sides of the joint. Sealants shall be installed free of air pockets, foreign embedded matter, ridges and sags. Sealer shall be applied over the sealant when and as specified by the sealant manufacturer.

3.3 CLEANING

The surfaces adjoining the sealed joints shall be cleaned of smears and other soiling resulting from the sealant application as work progresses.

- - o 0 o - -